

ITHAGINIS GEOFFROYI.

There are a pair of these birds in the collection. Mr. Pratt procured a clutch of seven eggs from a nest on the ground under the brushwood in the forest, 13,500 feet above the sea. It is a very common bird, and alights and probably roosts in the pine-trees. The eggs vary in size from 2.05 inches by 1.3 to 1.85 by 1.32 inch; in colour they resemble handsome eggs of *Tetrao tetrix*.

XXXIV.—*On British Fossil Birds.* By R. LYDEKKER, B.A.

OWING to the absence in the British Isles of strata corresponding to the freshwater Miocene beds of France in Gers, Allier, and the Auvergne, in which well-preserved bird-remains are of such common occurrence, the list of fossil birds found in this country is comparatively small. The total number of species recorded, indeed, is only slightly over 60; and since some 45 of these belong to existing species, of which the remains are found in caverns, the fens, and other superficial deposits, the list of extinct forms sufficiently well described to be admitted as valid ones falls short of 20. It must not, however, on this account be presumed that the subject of British Fossil Birds is one of only slight interest or importance. Indeed, the very reverse of this is the case, for while the existing species the remains of which occur in the superficial deposits afford some interesting information in regard to geographical distribution, the extinct species found in the London Clay belong either to types totally unknown elsewhere, or represented abroad by kindred but distinct genera. Again, the little that is yet known of the extinct birds of the Upper Eocene beds of Hordwell, in Hampshire, indicates that we have there an avian fauna which contains types at present unknown in the corresponding strata of the Paris basin. Unfortunately the bird-remains from these Hordwell beds are comparatively rare, are frequently very imperfect, and are distributed through several museums, so that the means of comparison and the consequent determi-

nation of the affinities of their owners are matters of some difficulty. There is moreover, doubtless, much to be done in collecting bird-bones from these deposits, and also in recording where specimens already collected are preserved; and one of the results of the present article may be to direct attention to these points.

Since so few ornithologists have that intimate acquaintance with those minute osteological differences in birds which are essential for the determination of fossil specimens, it is somewhat difficult to write an article on the subject of fossil birds, which shall not be, on the one hand, an elementary treatise on avian osteology, or, on the other, burdened with technical expressions and terms, the meaning of which will be found difficult to comprehend. Bearing in mind this difficulty, it has been thought best to avoid osteological descriptions as much as possible—merely pointing out, when required, some of the more striking features by which particular bones of certain groups may be recognized. While on this subject, attention may, however, be directed to the imperfection of all collections of avian osteology, the best of them only having skeletons of a certain number of species of a larger or smaller number of genera. This deficiency—which is especially noticeable in the Anseres—renders it absolutely impossible to determine specifically a considerable number of bird-bones obtained from the British Pleistocene deposits; and this impossibility will continue until our national collection obtains skeletons of all the larger birds, not only of the British Isles, but also of the greater part of the Palæarctic region.

A further difficulty in the study of fossil birds should not be passed over without a brief notice. This difficulty lies in the circumstance that the osteological differences by which the “long-bones” of most of the groups of existing birds are separated from one another are so slight and trivial that when we come to extinct genera it is frequently well-nigh impossible to determine how much value we should attach to the differences we may observe in these bones, in regard to the affinities of their owners to existing types.

In the present survey of our knowledge of British Fossil Birds it will be convenient to take them in their geological sequence, commencing with the superficial deposits, and ending with the Cambridge Greensand—the lowest English horizon from which bird-remains have yet been obtained. References to genera and species hitherto described will be found in Woodward and Sherborn's 'Catalogue of British Fossil Vertebrata,' and in the writer's 'Catalogue of Fossil Birds in the British Museum.'

I. BIRDS OF THE SUPERFICIAL DEPOSITS.

Under this heading we may include all the fossiliferous deposits down to the Norwich Crag, which is of uppermost Pliocene age; the so-called Forest-bed, which some authorities refer to the Pleistocene, and others to the Pliocene, being included in the present section. The deposits thus included comprise the fens of Cambridgeshire, Lincolnshire, &c., some portions of which probably belong to the historic period, while the lower beds are doubtless prehistoric, and still older ones of Pleistocene age. The turbaries of Walthamstow, Essex, which have furnished remains of Red Deer and other Mammals not now found in that district, apparently indicate a horizon not far removed from that of some portion of the fen-deposits. Then, again, we have the numerous cavern-deposits, where bird-remains are found in association with those of the Mammoth, Woolly Rhinoceros, and Cave-Hyæna; also the brick-earths of the Thames Valley at Grays, Ilford, and elsewhere, where the same Mammals also occur. At various places on the coast of Norfolk, such as Palling and Mundesley, there occur superficial deposits yielding bird-remains, some of which should probably be referred to the recent, and others to the upper part of the Pleistocene period; the above-mentioned Forest-bed being on a lower horizon.

So far as can be determined, with one exception, all the remains of birds obtained from the deposits mentioned above appear to be referable to existing species. When, however, we bear in mind the slight differences between the bones of

many existing species of birds, and also recollect that many of the Mammals of the Pleistocene period are extinct, the suggestion arises that if these fossil birds were before us in their flesh and feathers some of them would present differences from their living representatives which might entitle them to rank as distinct species. Still, however probable this idea may be, our only course is to take the evidence as it is presented to us; and this is to the effect that no differences of specific value can be detected between the bones of the British Pleistocene birds and those of the present day.

In treating of the birds of the superficial deposits (and likewise when we come to those of the older horizons) it will be convenient to consider them in natural sequence under their respective groups.

Passeres.—The list of fossil Passerines is very short, and presents nothing interesting from a distributional point of view. An ulna of a small bird from the celebrated cave of Kirkdale, in Yorkshire, figured in Buckland's 'Reliquiæ Diluvianæ,' has been referred to the Lark (*Alauda arvensis*); but it may be questioned whether such a specimen is sufficient to admit of the determination of the genus and species, and, in any case, there is no definite information as to the horizon from which it was obtained. From a cave at Knockninny, in Ireland, the Rev. Professor Haughton records a skull of the Starling (*Sturnus vulgaris*). The three remaining species all belong to the *Corvidæ*. Of these, several bones of the Raven (*Corvus corax*) have been obtained from a cave at Shandon, near Dungarvan, Co. Waterford, Ireland; but whether they came from the same horizon as the one yielding teeth and bones of the Mammoth does not appear certain. An ulna of the same species from Kirkdale cave is figured by Buckland in the work already cited; while a femur referred to the same bird has been mentioned by Mr. J. A. Smith as having been obtained from superficial deposits in Linlithgowshire. The bones of the Raven, it may be observed, are easily distinguished from those of all other Passerines by their superior size; but agree with those

of other members of that group in their general characters. Thus the coracoid may be recognized by its length and slenderness, the small subclavicular process, without a perforation at its base, and the descending hook-like process from the head. The humerus is a very characteristic bone, having a forked ectepicondylar tuberosity at its lower end near the radial condyle, and a minute tubercle on the middle of the palmar surface of the same, just above the condyles. The tibia may be recognized by the width of the gorge separating the equal-sized and everted condyles on the anterior surface of the lower extremity, in the middle of which is a small depression for the attachment of the articular ligament. Part of a smaller tibia presenting the above characters from the superficial deposits of Palling, Norfolk, belongs to the Crow (*C. corone*=*C. cornix*); whilst the former existence of the Chough (*Pyrrhocorax graculus*) in Yorkshire is proved by an ulna from Kirkdale cave preserved in the British Museum. Of late years the nearest localities to Yorkshire where the Chough has been recorded are the neighbouring counties of Cumberland and Westmoreland.

Striges.—The leg-bones of the Owls are so easily recognized that there is no possibility of confounding them with those of any other birds except *Pandion* among the Accipitres. Thus the tibia is peculiar among European birds in having no bony bridge over the grooves for the extensor tendons on the anterior surface of the lower end. Again, the tarso-metatarsus is comparatively short and wide, with the lower part of the front of the shaft convex, and a deep depression on the upper part of the same; the hinder surface being deeply channelled, and the three distal condyles reaching to nearly the same level, and arranged in an arch. In the tarso-metatarsus of all the larger species there is (as in *Pandion*) a bony bridge over the inner half of the large superior depression on the front surface. The only two Owls hitherto recorded from British strata are the Eagle Owl and the Snowy Owl. The Eagle Owl (*Bubo ignavus*), now so rare in England, is represented by an incomplete tarso-metatarsus from the Norfolk Forest-bed; this bone being com-

paratively long in *Bubo*. In the Snowy Owl (*Nyctea scandiaca*) the tarso-metatarsus is much shorter. An entire specimen of this very characteristic bone has been obtained from Kent's Hole cavern, near Torquay, and is preserved in the British Museum. A living example of this bird has once been recorded from Devonshire; but the occurrence of its remains in the caverns of France shows that the southern limits of its normal range were formerly much lower than is now the case.

Accipitres.—In the Old World Accipitres, exclusive of the Owl-like *Pandion*, the tarso-metatarsus differs from that of the Striges by the flatter plane in which the distal condyles are placed; and also by the absence of the bony bridge over the outer part of the depression at the upper end of the front surface. The tibia likewise differs in the marked flattening of the lower end, and in the presence of a bony bridge over the groove on the anterior face of the same, the front surfaces of the lower condyles being but very slightly prominent. The Pleistocene representatives of this group are three or four in number. The largest of these is represented by a terminal claw of the first or second digit of the foot obtained by Colonel Wood from a cave at Gower, in Glamorganshire, and presented by him to the British Museum. This specimen was obtained in company with remains of extinct mammals, and appears to have belonged either to the Golden Eagle (*Aquila chrysaëtus*) or to an equally large species. The superficial deposits of Walthamstow, Essex, have yielded the left tibia of a species of *Haliaëtus*, which, while differing in several respects from the corresponding bone of the European White-tailed Eagle (*H. albicilla*), comes so close to that of *H. pelagicus*, of Siberia, as to indicate that it belongs either to that or to a closely related species. Assuming this reference to be correct, it would appear to be a more marked instance of the southward extension in Pleistocene times of northern species than the one already alluded to under the head of the Snowy Owl. From a cave at Berry Head, near Torbay, Sir R. Owen, on page 558 of his 'British Fossil Mammals and

Birds,' mentions bones of an Accipitrine rather larger than the Peregrine Falcon; nothing is, however, known as to what has become of these specimens, and nothing can, therefore, be predicated as to the species to which they belonged, although it is quite possible that they should be referred to the Buzzard. Satisfactory evidence of the existence of the last-named species (*Buteo vulgaris*) in the Pleistocene of Devonshire is afforded by three specimens in the British Museum from Brixham cave, near Torquay. One of these specimens is an imperfect sacrum and pelvis, which exhibits the sudden deflection of the hinder part of the ilia so characteristic of the Accipitres.

Steganopodes.—In this group the most remarkable feature in relation to the British superficial deposits is the occurrence of a species of Pelican in the Norfolk fens, as shown by an imperfect immature humerus in the Woodwardian Museum at Cambridge. Pelicans, it need scarcely be said, are unknown to the existing British fauna, the few individuals that have reached our shores having been blown thither. This explanation, as M. Milne-Edwards remarks in his classic work on fossil birds, will, however, not serve in the case of the Norfolk Pelican, since the humerus by which it is known indicates a bird too young to have performed such a long flight. We are, therefore, compelled to regard this Pelican as indigenous to England, and since the humerus in question is larger than that of *Pelecanus onocrotalus*, and when adult would have attained still more considerable dimensions, there is a possibility that it indicates a peculiar species*.

Few bird-bones are more characteristic than the coracoid of the genus *Phalacrocorax*, in which the shaft is very slender, the subclavicular process approximated to the head, the intermuscular ridge on the anterior surface very pronounced, and the sternal extremity with a distinctive "tenon-and-mortise" articulation. A coracoid of this description from the Pleistocene brick-earth deposits of Grays, in Essex, is

* For a description of the type specimen see A. Newton, Proc. Zool. Soc. 1868, p. 2, and 1871, p. 702.

preserved in the British Museum, and, since it is indistinguishable from the corresponding bone of the Common Cormorant (*P. carbo*), has been referred by M. Milne-Edwards to that species. The proximal extremity of a coracoid from the Norfolk Forest-bed is considered by Mr. E. T. Newton as sufficient evidence of the existence of the Cormorant at that still earlier epoch. Remains of the Cormorant are also recorded by Mr. S. Laing from "kitchen-middens" in Caithness, which have likewise yielded bones of the Shag (*P. graculus*) and of the Gannet (*Sula bassana*).

Herodiones.—The only remains of this group from British superficial deposits are a few bones of the Bittern (*Botaurus stellaris*) from the Cambridgeshire fens, figured in the great work of M. Milne-Edwards. Among these are a humerus and a tarso-metatarsus; the former of which exhibits the characteristic slenderness and slight expansion of its extremities distinctive of the *Ardeide*; while the latter, besides exhibiting the comparatively long and slender shaft, large proximal talon, and the disposition of the three distal trochleæ on nearly the same horizontal line, which are characteristic of the Heron family, also shows the relative shortness and stoutness by which the metatarsus of the Bittern differs from that of the Heron. The Cambridgeshire and Norfolk fens were among the last strongholds of the Bittern in this country.

Anseres.—As might have been expected from their habits, bones of *Anseres* are among the commonest bird-remains found in the British superficial deposits; but from the lack of a sufficiency of recent skeletons in our museums for comparison, to which allusion has already been made, many of these specimens cannot be specifically—or even generically—determined; while in other cases some of the determinations which have been made must be regarded as more or less provisional. The bones of *Anseres* are generally easily recognized; this being especially the case with regard to the tarso-metatarsus, tibia, humerus, and coracoid, which are some of those most commonly met with. The most characteristic features of the tarso-metatarsus are its shortness and

stoutness, the nearly cylindrical middle region of the shaft, the absence of any groove down the back of the latter, the closed tubes perforating the hinder part of the proximal extremity, and the reflection of the small and short second or inner distal trochlea. The inflection of its distal extremity, in which the bony bridge over the extensor groove is deeply sunk and has no tubercle, alone suffices to distinguish the tibia; although the somewhat longer and more slender tibia of the Coot (*Fulica*) presents an approximation to the same form. The comparatively long and slender humerus may generally be recognized by the very large size of the aperture of the pneumatic foramen at its proximal extremity; while the coracoid is equally slender, and sufficiently characterized by the slightness of its articulation with the sternum, the high position and crotchet-like form of the subclavicular process, and the abrupt truncation of the lower part of the posterior border.

Among the Geese, or *Anserinæ*, remains of the Grey Lag Goose (*Anser cinereus*),—now so rare in this country, and only breeding on a few Scottish lakes, although formerly abundant in the eastern counties,—have been obtained from the fens of Cambridge and Norfolk, as well as from river-deposits near Salisbury; while some bones in the British Museum from the Pleistocene brick-earth of Grays are probably likewise referable to this species. To the somewhat smaller Bean Goose (*A. segetum*), which, although never breeding in the British Isles, is very abundant during the winter in Ireland, have been referred provisionally certain bones from Shandon cave, Co. Waterford; while several bones in the British Museum from Kent's Cavern, Torquay, cannot be distinguished from corresponding recent bones. Remains of Geese from the brick-earths of Ilford and Grays, which have not been specifically determined, are rather larger than the corresponding bones of the recent skeleton of a Bean Goose with which they were compared. Mr. E. T. Newton also refers to an undetermined Goose a metacarpus from the Norfolk Forest-bed. On the Continent we have evidence of a species of *Anser* from the Upper Miocene of Ceningen, on

the borders of Baden and Switzerland, as well as from the Lower Miocene of Allier, so that the genus is comparatively an old one. In the allied genus *Bernicla*, the humerus may be distinguished from that of *Anser* by the sudden rise of the delto-pectoral crest from the shaft ; while the coracoid is more slender and has a larger pneumatic foramen. Coracoids presenting these characters from the Shandon cave, Co. Waterford, have been provisionally referred to the Barnacle Goose (*B. leucopsis*), but it is by no means certain that they do not belong to the commoner Brent Goose (*B. brenta*), to which species have been tentatively assigned a radius from Walthamstow, and a coracoid from Kirkdale cave.

Among the Swans (*Cygninae*) remains indistinguishable from those of the Hooper (*Cygnus musicus*) have been obtained from the brick-earths of Ilford and Grays, and also from superficial deposits at Dungarvan, Co. Waterford, Ireland, while M. Milne-Edwards records others from the fens of Cambridgeshire. A series of bones from Southery fen, Norfolk, preserved in the British Museum, may belong either to a female of this species, or to the somewhat smaller Polish Swan (*C. immutabilis*). To the still smaller Bewick's Swan (*C. bewicki*) have been provisionally assigned some bones from the Shandon cave, Co. Waterford, and also a tarso-metatarsus in the British Museum from the peat of Monmouthshire.

Coming to the Ducks or *Anatinae*, we have first to notice the occurrence of a species of *Tadorna* in the Pleistocene of Brixham cave, near Torquay, as exemplified by a large series of specimens in the British Museum. These bones indicate a bird of somewhat larger size than the Ruddy Sheldrake (*T. casarca*). One of these specimens shows the great development of the keel of the sternum, and the square shape of the pneumatic foramen leading into this keel, by which *Tadorna* may be distinguished from *Anas*. Remains of the Mallard (*Anas boschas*) are recorded by M. Milne-Edwards from the fens of Cambridgeshire, and egg-shells from a river-deposit near Salisbury have likewise been referred to this species. Bones of the Common

Teal (*Querquedula crecca*) have also been recognized by M. Milne-Edwards among those obtained from the Cambridgeshire fens. A single coracoid from the Norfolk Forest-bed described by Mr. E. T. Newton appears to indicate the occurrence of the Shoveller (*Spatula clypeata*) at that epoch; and another coracoid from Kirkdale cave was stated by Dr. Buckland to have belonged to "a small species of Duck, resembling the Summer-Duck" of North America. Such a statement cannot, however, be taken to justify the inclusion of *Æx sponsa* in our Pleistocene fauna. It is uncertain whether various bones of Ducks which have not been generically determined should be referred to members of the present or of the following subfamily.

All the members of the subfamily *Fuligulinæ* are readily distinguished from the typical *Anatinæ* by the remarkable flattening of the upper part of the anterior surface of the shaft of the tibia, as well as by certain differences in the form of the humerus. A series of bones, including the characteristic tibia, from the superficial deposits of Bacton, in Norfolk, preserved in the British Museum, appear referable to the Pochard (*Fuligula ferina*). The Eider Duck (*Somateria mollissima*), indigenous in the northern part of the British Isles, is known in a fossil state by a skeleton obtained from superficial deposits, which may be of Pleistocene age, at Stratheden, Scotland. A coracoid from Shandon cave, Co. Waterford, has also been referred to this species, and if rightly determined is of considerable interest, the Eider-Duck being now an extremely rare visitor to Ireland. Lastly, we have a portion of a skull from superficial deposits at Tyrie, Scotland, which has been provisionally assigned to the Common Scoter (*Ædemia nigra*).

Columbæ.—The only recorded instances of the occurrence of the remains of Pigeons in British Pleistocene deposits are two in number. The first is an ulna from Kirkdale cave, which was stated by Buckland to indicate a species larger than our wild or domestic kinds, and the second a metacarpus of *Columba livia* from the peat of Monmouthshire.

Gallinæ.—Most of the bones of the Gallinæ are easily re-

cognized, some of the most characteristic being the coracoid, the humerus, the metacarpus, and the tarso-metatarsus. Thus the coracoid is extremely long and narrow, with the subclavicular process aborted and its sternal surface short and oblique. The short humerus has a very characteristic curvature, a small and incurved delto-pectoral crest, and the aperture of the pneumatic foramina of moderate size, and generally opening on the flat surface of the bone. The metacarpus, except in *Numida*, the *Cracidae*, and the *Turnicidae*, differs from that of all other birds, with the exception of certain Passerines, in having a thin flange of bone projecting from the stouter to the smaller bar. The stout and moderately long tarso-metatarsus is somewhat flattened from front to back, with two strong ridges on the hinder surface, a single tube at the proximal end, and the second distal trochlea rather shorter than the fourth and somewhat reflected.

In the *Tetraonidae*, evidence of the former existence of the Capercaillie in England is afforded by a series of bones discovered in a cave near Teesdale, Yorkshire, of which an account will be found in the last edition of 'Yarrell.' The writer is also inclined to believe that a coracoid in the British Museum from the superficial deposits at Ostend, near Bacton, Norfolk, should be referred to a young individual of this species.

The Black Grouse (*Tetrao tetrix*) is represented by a femur from Kent's Cavern, Torquay, as well as by a humerus in the British Museum from the peat of Monmouthshire; there is also a humerus recently recognized by the writer in the Dublin Museum, which was obtained from a cave in county Waterford. The latter specimen is of especial interest, as there is no other record that the Black Grouse was ever indigenous in Ireland. Of not less interest is the former occurrence in that country of the Ptarmigan (*Lagopus mutus*), as proved by several bones from the Shandon cave, Co. Waterford. It was originally suggested by Prof. A. Newton, to whom they were submitted, that these bones might belong to small females of the Red Grouse (*Lagopus scoticus*), but there can be no hesitation in regarding them as referable to

the Ptarmigan. The former occurrence of this species, coupled with the probable contemporaneous existence of the Eider Duck in Ireland, points to its Pleistocene avian fauna having been of a more northerly type than it is at the present day,—an inference supported by the occurrence of the Reindeer and the Mammoth in the Irish cavern-deposits. As regards the *Phasianidæ*, remains of the Partridge (*Perdix cinerea*) have been obtained from Kirkdale cave.

Fulicariæ.—The only species of this group occurring in British deposits is the Common Coot (*Fulica atra*), remains of which were recorded by M. Milne-Edwards from the fens of Cambridgeshire, while the writer has recently recognized a tibia among a series of bones from the Ballynamintra cave, Co. Waterford, preserved in the Dublin Museum. Although the leg-bones of the *Fulicariæ* are generally more like those of the *Gallinæ* than any other group, there is a tendency to an inflection of the lower end of the tibia, which attains its maximum in *Fulica*, but, as already observed, the tibia of this genus may be readily distinguished from that of the Ducks by its greater relative length and slenderness.

Alectorides.—According to Yarrell, the recorded instances of the occurrence of the Crane (*Grus cinerea*) in Ireland are only four in number, but from the discovery of its remains in the “kitchen-middens” of Ballycotton, Co. Cork, we must consider that it was formerly indigenous in that country, as it certainly was in the English fens.

Limicolæ.—The humerus of the *Limicolæ* differs from the corresponding bone of all the groups hitherto considered in the presence of a distinct ectepicondylar process projecting from the outer border of the lower end immediately above the radial condyle. It is suggested by Dr. Buckland that a small humerus of this type from Kirkdale cave belongs to the Snipe (*Scolopax gallinago*), a reference which may very probably be correct.

Pygopodes.—The *Alcidæ* are distinguished from the other members of this group by the comparative length of the femur, by the absence of a long ankylosed spine-like patella to the tibia, and by the comparative shortness and stoutness of the

tarso-metatarsus, in which the lateral compression of the shaft is but slight, and its second trochlea only moderately reflected. In this family remains of the Great Auk (*Alca impennis*) have been found in superficial deposits in the Cleadon Hills, Durham, and likewise at Oronsay and Caithness, in Scotland, while the "kitchen-middens" of Caithness have also yielded remains of the Razor-bill (*A. torda*). The extreme shortness, width, and strong curvature of the femur of the *Colymbidæ*, the production of the patella into a long spine ankylosed to the tibia, and the excessive lateral compression of the comparatively long and slender tarso-metatarsus, in which the small second trochlea is so much reflected as to become almost behind the third, suffice to distinguish them very widely from the corresponding bones of any other birds. In this family remains of the Red-throated Diver (*Colymbus septentrionalis*) have been obtained from Shandon cave, Co. Waterford, and also from the river-deposit of Mundesley, Norfolk, which is of later age than the Forest-bed. Bones of the Crested Grebe (*Podiceps cristatus*), which was formerly abundant in the "broads" of Norfolk and the fens of Lincolnshire, have been recorded by M. Milne-Edwards from the fen-deposits of Cambridgeshire.

II. BIRDS OF THE PLIOCENE.

If we exclude the Norfolk Forest-bed from the Pliocene, only two species of birds have been recorded from these deposits in Britain.

Tubinares.—One of the most unexpected "finds" in the Red Crag of Suffolk was the tarso-metatarsus and one phalangeal of the foot of a species of Albatross (*Diomedea*). The tarso-metatarsus of the Albatross is a very characteristic bone, somewhat smaller and relatively more slender than that of a Swan; from which it is distinguished by the more equal size of the three distal trochleæ, the second of which is only slightly shorter than the fourth, and is but little reflected, while the foramen between the third and fourth is situated much higher up than in the Anseres. Moreover, the front surface is distinctly grooved, and there is no closed tube at

the upper end. An ulna from the underlying Coralline Crag preserved in the Museum of Practical Geology appears to belong to the same species. Seeing that no Albatross is now found anywhere near the British Isles, it is probable that the bones from the Crag indicate a distinct species, for which the name of *D. anglica* has been suggested by the writer.

Pygopodes.—According to Prof. W. H. Flower, a humerus from the Norwich Crag preserved in the Museum at Norwich belongs to the Guillemot (*Uria troile*), colonies of which bird existed up to about the middle of this century on the neighbouring cliffs of Cromer and Hunstanton.

III. BIRDS OF THE UPPER EOCENE (OLIGOCENE).

Before noticing the birds from the Upper Eocene beds of Hordwell, Hampshire, it should be observed that an imperfect coracoid of a large bird from the Lower Miocene beds of Hempstead, in the same county, preserved in the Woodwardian Museum at Cambridge, has been made the type of the genus *Ptenornis*. The very slight description which has been given of this specimen, and the absence of a figure, render it, however, impossible to come to any conclusion as to its affinities. With one exception, all the bird-remains from Hordwell have been referred to extinct genera.

Accipitres.—Evidence of the existence of an Accipitrine bird, but little smaller than the Golden Eagle, is afforded by two terminal phalanges of the feet from the Hordwell beds preserved in the British Museum. Possibly these specimens may prove to belong to an Accipitrine from the corresponding horizon of the Paris basin described by M. Milne-Edwards as *Palaohierax gervaisi*.

Steganopodes.—The ulna of a Cormorant is distinguished from that of all other birds by the crotchet-like process projecting outwards and downwards from the surface for the radial condyle of the humerus. The proximal end of an ulna somewhat smaller than that of the Cormorant, preserved in the British Museum, has a somewhat similar process, and thus appears to indicate the occurrence in the Hordwell beds of a Cormorant-like bird, for which the name *Actiornis anglicus* has been suggested by the writer.

Herodiones.—In this group the family *Plataleidae* appears to be represented in the Hordwell beds by a bird allied to the Ibises, and of the approximate dimensions of the existing *Ibis rubra*, which the writer has proposed to designate *Ibidopsis hordwelliensis*. It is typified by the lower part of a tibia, which agrees in all essential characters with the corresponding bone of *Ibis*—especially in the absence of a tubercle near the bridge over the extensor groove,—but differs in the relative width of the anterior gorge between the two condyles. The rostrum of a long-billed bird from the same deposits, agreeing with that of *Ibis* in having a lateral groove, but deflected only at the tip, probably belongs to this extinct genus, and if so well distinguishes it from living Ibises.

Odontoglossæ.—The English Upper Eocene deposits have hitherto yielded no remains of true Flamingoes, or of the allied but more generalized *Palælodus*, which are so common in the Lower Miocene of the Continent. There is, however, undoubted evidence of the occurrence of British Flamingo-like birds at the epoch of the Hordwell beds. Thus a humerus in the British Museum, measuring somewhat less than five inches in length, agrees so closely with the much larger humerus of a Flamingo that it scarcely presents characters of generic distinction. It is highly probable that this specimen should be referred to that imperfectly known genus of Flamingo-like birds from the lowest Miocene of France described as *Helornis**, in which the general characters are those of *Phænicopterus*, but the legs were proportionately shorter. The writer has therefore proposed to designate the English bird as *Helornis* (?) *anglicus*. Two imperfect specimens of the tibia of a Flamingo-like bird from Hordwell indicate a considerably larger species, which should, perhaps, be likewise referred to *Helornis*. There is some doubt as to the serial position of a still larger Hordwell bird indicated by a nearly entire coracoid in the British Museum measuring somewhat more than $2\frac{1}{2}$ inches in length. On the whole, however, this specimen seems to come nearer to the corresponding bone of the Flamingoes than to that of any other

* Originally incorrectly given as *Elornis*.

group; and the writer is accordingly inclined to think that it may belong to the imperfectly known genus *Agnopterus*, from the corresponding beds of the Paris basin, which appears to be more or less closely allied to the Flamingoes, although not improbably indicating a distinct family. The upper part of a large femur from Hordwell, preserved in the Museum of Practical Geology, and remarkable for the great length of its neck, agrees in relative size with the coracoid, and may therefore have belonged to the same bird, which the author has designated *Agnopterus* (?) *hantoniensis*.

Alectorides.—Two very characteristic features occur in the osteology of the Cranes. The first is the presence of an enormous pneumatic foramen on the inner surface of the lower end of the coracoid. The second is the great width of the gorge separating the two condyles on the anterior face of the lower end of the long tibia, and also the sunken position of the bony bridge over the extensor groove, which carries a small tubercle; moreover, the inner condyle of the tibia is placed considerably to the inner side of the corresponding border of the shaft, while on the opposite border of the anterior surface of the lower end there is a distinct groove for the tendon of the external peroneus muscle. All the characters above mentioned are displayed in the lower part of a tibia in the British Museum from Hordwell, indicating a Crane somewhat smaller than *Grus virgo*, which the writer has proposed to call *G. hordwelliensis*. A coracoid of a much smaller bird in the same collection shows the enormous pneumatic foramen characteristic of the Cranes, and in the opinion of the writer clearly indicates a small member of the family, which may be known as *Geranopsis hastingiæ*.

Pygopodes.—A small coracoid from Hordwell in the British Museum shows the peculiar crotchet-like process projecting from the upper part of the hinder border of the lower extremity characteristic of the *Colymbidæ*; and the writer has accordingly referred the owner of this bone to the genus *Colymboides*, founded upon the evidence of other remains from the Lower Miocene of France, with the affix of *C. anglicus*.

Finally, nothing can at present be said as to the affinities of the upper part of a tibia from Hordwell in the Woodwardian Museum at Cambridge, briefly described, without a figure, as *Macrornis tanaupus*. Mention must also be made here of a tarso-metatarsus from Hordwell, noticed on p. 557 of Owen's 'British Fossil Mammals and Birds.' This specimen was formerly in the collection of Mr. J. W. Flower, but was subsequently transferred to the Museum at Oxford. There, however, according to information kindly supplied to the writer by Prof. A. H. Green, it cannot now be found, although it may be stowed away in certain cases not yet unpacked. According to Sir R. Owen, this bone closely resembles a tarso-metatarsus from the Paris basin figured in Cuvier's 'Ossemens Fossiles,' vol. iii. pl. lxxii. fig. 2; and it doubtless indicates a species different from any of those noticed above from the Hordwell beds.

IV. BIRDS OF THE LOWER EOCENE.

A long gap occurs between the horizon of the Hordwell beds and that of the London Clay, which is the next deposit in descending order where bird-remains are met with. Here, as might be supposed, not only are all the genera extinct, but many of them depart very widely from existing types, and at least some of them indicate extinct families; although all the Carinate genera appear referable to existing ordinal groups. It is in the Lower Eocene that in Europe we first meet with remains of birds that may apparently be referred to the Ratitæ. The majority of the Lower Eocene bird-remains have been obtained from the Isle of Sheppey; but unfortunately, both here and elsewhere, they generally consist of isolated bones (which are frequently imperfect), so that there is in many cases a certain amount of difficulty and uncertainty in determining the number of species we have to deal with.

Accipitres.—The earliest evidence of the occurrence of remains of birds from the London Clay was afforded by a specimen from Sheppey which came into the possession of John Hunter before the year 1793, and is now in the Museum

of the Royal College of Surgeons. This specimen, which was described and figured in Owen's 'British Fossil Mammals and Birds,' under the name of *Lithornis vulturinus*, comprises the mutilated sternum, coracoids, a vertebra, portions of the femur and tibia, and some other imperfect bones. Relying chiefly on the characters of the sternum, which must have belonged to a bird with this part of the skeleton either entire or having only shallow notches on its distal border, Sir R. Owen came to the conclusion that the specimen indicated a small Accipitrine bird more nearly allied to the American *Cathartidæ* than to any other existing type. It indicates a bird of the approximate size of the Peregrine Falcon (*Falco peregrinus*); but the shaft of the coracoid is proportionately much narrower, and the femur smaller and weaker than in any living Accipitrine genus. The present writer cannot find any especial approximation to these peculiarities in the skeleton of the *Cathartidæ*, the Sparrow-Hawk coming nearer in the former, and the Kites (*Circus*) in the latter respect. As tending to confirm the conclusion that *Lithornis* is truly an Accipitrine, important evidence is afforded by a pelvis and sacrum from Sheppey presented to the British Museum by Mr. W. H. Shrubsole. This specimen, which agrees in relative size with the typical sternum, shows the marked deflection of the dorsal aspect of the hinder part of the ilia, which is such a marked peculiarity of the Accipitres, and is found in no other living birds. The British Museum also possesses an imperfect sternum, associated with some other broken bones, which appears referable to this species.

So far, therefore, as the available evidence goes, it points to the conclusion that *Lithornis* is the earliest known representative of the Accipitres, although it is probable that it cannot be included in any of the existing families. It is, however, much to be wished that we could obtain a specimen of the tarso-metatarsus, which would set the question at rest; and it is only fair to observe that if, as appears to be the case, *Lithornis* was comparatively common in the old Sheppey area, this circumstance is somewhat against its Accipitrine

two humeri of a bird which was recognized by their describer as closely allied to the French *Pelagornis*. Although he quotes M. Milne-Edwards's figure of the type of the latter, Sir R. Owen totally ignores the observations of that zoologist as to the Steganopodous affinities of *Pelagornis*, and proceeds to compare *Argillornis* with *Diomedea*, in consequence of which he misinterprets some of the features of the humerus in his figures. From an examination of these humeri (which are now in the British Museum) the present writer is convinced, not only of their close affinity with *Pelagornis*, but also of their relationship to *Sula*. It is, indeed, at first sight somewhat difficult to point out how the type of humerus in *Argillornis* can be generically distinguished from that of *Pelagornis*; although, from the characters of the undermentioned ulna, it is probable that the one differed from the other in the presence of a distinct olecranal fossa. A fragment of the shaft of a similar humerus had been previously described in 1854 by the late Dr. Bowerbank as *Lithornis emuinus*; the generic name is, however, preoccupied by the above-mentioned Accipitrine genus, and since the specific one is inapplicable to a short-legged volant bird it has been rejected in favour of the Owenian term. In 1866 Prof. H. G. Seeley, when describing a somewhat similar fragment of bone, which he identified with the so-called *Lithornis emuinus*, proposed to replace the name *Lithornis* by *Megalornis*, but the latter term had been employed in 1840 by Dr. Gray in a different sense. The fragment of bone in question was regarded by its describer as part of the tibia of a Ratite bird; but Sir R. Owen pointed out a serious objection to this view, and it is probable that the specimen is really part of the distal extremity of the left humerus of *Argillornis*.

The British Museum possesses part of the proximal extremity of a left ulna from Sheppey, which from its size and general character is evidently referable to the genus under consideration. This bone, which has a well-developed olecranon, closely resembles the ulna of the Gannet, and is utterly unlike that of the Albatross; it may, however, be generically distinguished from that of *Sula* by the absence

of the large pneumatic foramen which is so conspicuous on the anterior surface of the proximal extremity of the latter. In this respect the fossil agrees with the ulna of the Cormorants (*Phalacrocorax*), although it differs in other points.

One other specimen which has been referred to *Argillornis* must not be passed over without special mention. This specimen is an imperfect cranium from Sheppey, now in the British Museum, which was described and figured by Sir R. Owen in the 36th volume of the 'Quart. Journ. Geol. Soc.' From its somewhat small relative size as compared with the type humeri, this specimen may have belonged to a female bird, or may possibly indicate another species of the same genus. In describing this important specimen, the Professor, probably led away by his previous views as to the affinities of the humeri, compares it with *Diomedea*. It is, however, at once distinguished from the skulls of all the Tubinares by the presence of the distinct transverse hinge-joint between the frontals and the rostrum characteristic of the Steganopodes, and likewise by the absence of those deep supraorbital grooves which are so conspicuous in the skull of the Albatross. Now the presence of such a transverse hinge, coupled with the absence of supraorbital grooves, is one of the most characteristic features of the skull of the Steganopodes; and when we add to this that the general contour of the specimen (allowing for the effects of crush) is very similar to that of the skull of *Sula*, while the lateral groove formed by the junction of the two elements of the horny sheath of the rostrum has precisely the same position in the two genera, we shall have no reasonable doubt in concluding that the fossil skull indicates a Steganopodous bird. Further evidence to the same effect is afforded by the depression of the external surfaces of the lachrymals, and by the position and contour of the aperture of the posterior nares.

It is accordingly apparent that both the humerus on which the genus *Argillornis* was established, and the skull probably referable to the same genus, indicate Steganopodous birds, of which the nearest existing allies are the Gannets. And it may be added that this interpretation of the affinities of these

specimens is much more in harmony with the estuarine conditions which, from other lines of evidence, are inferred to have prevailed in Sheppey during the early Eocene epoch, than the view that these extinct birds were allied to such a purely pelagic type as the Albatross.

Another bird from the Sheppey Eocene seems to come nearer to the existing Steganopodes than to any other living forms, although clearly indicating a peculiar family. This is the *Odontopteryx toliapica* of Owen, founded upon the imperfect hinder portion of a skull described in the 'Quart. Journ. Geol. Soc.' for 1873. This skull, which is somewhat larger than that of the Common Gannet, differs from that of all other known birds in having the oral margins of both upper and lower jaws armed with a number of pointed serrations, some of which were larger than the others. In this respect it agrees exactly with certain Indian Chelonians, of the genera *Hardella* and *Batagur*; and it is evident that the horny covering of the jaws must have had serrations fitting on to those of the underlying bones, as is the case in the Chelonians referred to. Certain existing members of the Steganopodes, such as the Frigate-bird (*Tachypetes*) and the Gannet (*Sula*), approximate to *Odontopteryx* in having small serrations on the horny margins of the jaws, but these serrations are directed backwards instead of forwards. More important evidence of affinity is afforded by the deep grooves which occur on the jaws of the fossil, and show that their horny sheaths were composed of several distinct pieces, as is the case in *Tachypetes* and *Sula*. The fossil genus was regarded by its describer as allied to the Anseres, and the mandible was accordingly restored with a large recurved postarticular process. But the skull differs from that of all the Anseres in the shape of the quadrate, in which the posterior surface is broad, and emarginate externally, while the cup for the head of the quadrato-jugal is directed immediately outwards. Moreover, the depressed general contour of the cranium, and apparently also the form of the lachrymals, are of the general type obtaining in the Steganopodes. The fossil skull differs, however, from all the existing

members of that group in having no distinct temporal fossæ. In addition to the skull, the British Museum possesses the proximal extremity of a left ulna, which may very probably be referred to the present species, although, perhaps, not to the same sex as the skull. This bone is very similar to the larger ulna of *Argillornis*, and, if rightly referred to *Odontopteryx*, clearly points to the Steganopodous affinities of that genus. The proximal portion of a tarso-metatarsus from Sheppey, recently presented to the national collection by Mr. W. H. Shrubsole, may likewise be provisionally assigned to *Odontopteryx*, and, so far as its condition permits of forming a judgment, appears to be of a Steganopodous type. It is probable, however, that this tarso-metatarsus differed from the corresponding bone of the existing representatives of the group in the much smaller development of its talon (hypotarsus)—a feature which appears to be characteristic of many of the earlier birds.

Herodiones.—The Herons and their allies present the peculiar feature of the extensive overlapping of the distal extremities of the two coracoids, the grooves in the sternum for their reception likewise overlapping one another in a similar manner. There is, indeed, a somewhat similar overlapping of the coracoids in the Flamingoes (*Phænicopterus*), but in that genus the keel of the sternum is given off at a lower level than in the Herons. Some of the characteristic features of the tarso-metatarsus of the Herons have been mentioned when treating of the birds of the superficial deposits.

During the excavation of the tunnel of the North-Western (then London and Birmingham) Railway through the London Clay of Primrose Hill, there was discovered the sternum of a bird of about the size of the Purple Heron, which presents the overlapping of the coracoidal grooves and the relative high position of the keel characteristic of the existing Herons. This specimen, now in the British Museum, was described and figured in Owen's 'British Fossil Mammals and Birds' without any name; since, however, it clearly indicates a distinct genus, the writer has proposed to designate the bird to

which it belonged as *Proherodius oweni*. Quite recently the writer has had submitted to his notice the almost entire right tarso-metatarsus of a bird obtained from the London Clay near St. James's Park by Mr. W. J. S. Abbott, of 3 St. Peter's Road, Tufnell Park, N.W., which there is every reason to believe is referable to *Proherodius*. This bone, which agrees in relative size with the typical sternum, has unfortunately lost the middle and outer trochleæ from the distal extremity, although sufficient of their points of attachment remains to indicate their general proportions and relations. Now the general characters of this specimen are so essentially those of the modern Herons that the presumption is so strong as to amount almost to a certainty that it belonged to the bird primarily indicated by the sternum. In certain minor points, however, such as the inequality in the length of its three distal trochleæ, and the slight development of its proximal talon (in which there is no closed tube for the passage of tendons), this bone differs from the tarso-metatarsus of all existing *Ardeidæ*, and thus clearly shows that its owner belonged to a distinct family. The characters in which it differs from the *Ardeidæ* seem, however, to be generalized ones—this being certainly the case with the simple talon, and probably also with the inequality in the length of the trochleæ; and we may therefore fairly presume that we have in *Proherodius* the ancestral generalized type of the modern Herons.

Gaviæ.—The last of the Carinate birds from the London Clay to which a separate name has been assigned is typically known by the hinder part of a cranium from Sheppey, which has long been in the British Museum, and was figured in 1838 by the late Mr. König under the name of *Larus toliapicus*. In redescribing the specimen in his 'British Fossil Mammals and Birds,' Sir R. Owen came, however, to the conclusion that the owner of this skull had no sort of affinity to the *Gaviæ*, but was more nearly allied to the Kingfishers, and the new generic name *Halcyornis* was accordingly suggested. Now, although there is no question as to the generic distinctness of *Halcyornis* from *Larus* and its modern

allies, it appears to the present writer, after careful examination, that the original determination of Mr. König was much more nearly correct than the one subsequently advanced, and that the genus should probably find a place near the *Laridæ*. The whole form of the skull is, indeed, essentially Laroid, and quite unlike that of the Kingfishers; and, although Sir R. Owen was right in referring to the absence of distinct supraorbital grooves, yet, as there are traces of such grooves, we cannot on this account remove the genus from the Gaviæ, more especially as we might well expect to find these grooves less developed in an early ancestral type. Moreover, while a Kingfisher would not be the kind of bird whose remains we should expect to meet with in the Sheppey deposits, we should naturally look therein for the bones of Gulls. That Gulls did occur in those beds is proved by the distal extremity of a humerus in the British Museum, which exhibits the deep depression on the palmar aspect of that part of the bone, and also the point of attachment of the ectepicondylar process; both of which structural features are absolutely characteristic of the Larine humerus. And since there is the further probability that this Larine humerus may actually have pertained to *Halcyornis*, with the skull of which it agrees in relative size, we shall certainly be justified in placing that genus near the Gaviæ.

Other imperfect bones of Carinate birds, such as the sacrum figured on page 553 of Owen's 'British Fossil Mammals and Birds,' have been obtained from Sheppey, although none of those which have come under the author's notice are sufficiently well preserved or sufficiently characteristic to admit of the determination of their affinities. With the exception of the presumably Accipitrine genus *Lithornis*, the remains of which might well accompany those of truly estuarine birds, all the birds yet known from the old Eocene estuary of the Thames region are precisely those which we should expect to meet with in deposits of the nature of those of Sheppey. Thus the Gannets and Cormorants of the present day were represented by the gigantic *Argillornis* and the smaller *Odontopteryx*, while the place of

the Gulls which may now be seen around the Sheppey cliffs was taken by *Halcyornis*; and *Proherodius*, the remains of which have hitherto been found further inland, probably filled the rôle of the modern Herons in the surrounding swamps and marshes.

Ratitæ.—Many years ago certain limb-bones of an enormous bird were discovered at Meudon, in France, in Tertiary strata somewhat lower than the London Clay. For this giant bird the name *Gastornis* (a term, by the way, which ought in strictness to be discarded on account of its barbarism, being compounded from the French Christian name "Gaston" and the Greek "ornis") was proposed. Other remains of the same genus were subsequently discovered in beds of nearly similar age at Rheims; while the right of the genus to occupy a place in the British fauna rests on the evidence of several imperfect limb-bones found a few years ago by Mr. H. M. Klaassen in the Woolwich and Reading beds of Park Hill, near Croydon. The latter specimens were described by Mr. E. T. Newton in the 'Trans. Zool. Soc.' vol. xii. (1886), and were considered to indicate a new species, for which the name *G. klaasseni* was suggested. The Woolwich and Reading beds, it may be observed, lie below the horizon of the London Clay, from which they are separated by the intervening Oldhaven and Blackheath beds; and they are therefore not far separated in time from the beds which yielded the typical species of *Gastornis*.

The various species of *Gastornis* indicate birds of the approximate dimensions of some of the larger species of the New Zealand *Dinornithidæ*. They are characterized by the comparatively long and slender tarso-metatarsus, and also by the marked inflection of the distal extremity of the tibia, which has a bony bridge crossing the extensor groove of the anterior surface.

Much discussion has arisen as to the affinities of these huge Eocene birds: the general consensus of opinion inclining to the view propounded by M. Milne-Edwards, that they were more or less closely allied to the Anseres. This opinion appears to have been mainly based on the inflection of the lower end

of the tibia, and on the general absence of a bony extensor bridge in this bone among the Ratitæ. When, however, we reflect on the question of their alleged affinity to the Anseres it is very difficult to see how this view can be sustained. Thus, in the first place, it is impossible to imagine how such gigantic birds could have been swimmers, the very weight of their bones being probably enough to sink the greater part of their bodies below the surface of the water. And, in the second place, if they were not swimmers it is probable that the resemblance of their tibia to that of the Anseres is an accidental one, seeing that we must almost certainly regard its form in the latter group as connected with the function of swimming.

Then comes the question why *Gastornis* should not be referred to the Ratitæ, where, from its giant bulk, the *primâ facie* view would refer it. That the presence of the extensor bridge of the tibio-tarsus is no bar to this view is proved by the invariable presence of the same bridge in all the *Dinornithidæ*. Moreover, that member of the latter family described by Sir R. Owen under the name of *Dinornis elephantopus* presents an inflection of the lower end of the tibia at least as well marked as in *Gastornis*. Again, if the tibia of the latter be compared with that of the extinct Australian *Dromornis*, such a marked resemblance between the two will be observed as to render it almost certain that they are in some way connected, although the extensor bar is absent in the Australian genus.

It appears, therefore, to the writer that *Gastornis* should certainly find a place among the Ratitæ; and this leads to the further conclusion that the absence of the extensor bridge in the tibia of all the existing representatives of that division is in all probability an acquired feature, and that *Gastornis* and the *Dinornithidæ* present the original plan of structure which is also common to the greater number of the Carinatae, the absence of the tibial bridge in that division occurring only in specialized groups like the Owls, Parrots, and Hornbills. It will further be obvious that if this view be sustained it will strongly support the conclusion that the Carinatae and Ratitæ

were both derived from a common Avian stock, and have not originated separately from Reptiles.

The skull of a large bird from the London Clay described by Sir R. Owen in the 'Trans. Zool. Soc.' vol. vii. (1869) as *Dasornis* (correctly *Dasyornis*) *londiniensis*, and referred to the Ratitæ, appears to indicate a bird allied to *Gastornis*. Since, however, this skull differs to a certain extent from an imperfect example of that of the latter genus obtained by Dr. Lemoine from Rheims, it affords evidence that the large British Ratite bird of the London Clay was generically distinct from its ally of the underlying Woolwich and Reading beds.

V. BIRDS OF THE CRETACEOUS.

The well-known coprolite-beds of the Cambridge Greensand yielded so far back as 1858 not only the first evidence of Cretaceous birds, but also of the existence of the Avian class in the Mesozoic period. These remains were at first referred by Prof. H. G. Seeley to two genera, under the names of *Palæocolymbus barretti* and *Pelagornis sedgwicki*. The second generic name was, however, preoccupied, and when the specimens were subsequently described in the 'Quart. Journ. Geol. Soc.' for 1876, both species appeared under the name *Enaliornis*; but it may be questioned whether the substitution of this name for *Palæocolymbus* was not *ultra vires*.

Like all the remains from the Cambridge Greensand, the bones of *Enaliornis* are for the most part more or less broken and water-worn fragments; the most satisfactory specimens being examples of the distal end of the femur and tarso-metatarsus. Both the latter bones approximate so markedly to the corresponding portions of the skeleton of the Divers (*Colymbus*) that there can be but little hesitation in regarding the bird to which they belonged as more or less remotely allied to that genus. The tarso-metatarsus approximates to that of the *Colymbidæ* in its lateral compression, in the equality in the size and length of the third and fourth trochleæ, and in the shortness and extreme reflection of the second

trochlea. The femur likewise presents the extreme flattening from front to back characteristic of the corresponding bone of *Colymbus*, and was also relatively short.

A tarso-metatarsus from the Cretaceous rocks of the United States described by Professor O. C. Marsh as *Baptornis* so closely resembles that of *Enaliornis* as to indicate that it belonged to a closely allied, if not generically identical, bird, and from this type of tarso-metatarsus it is but a step to the still more remarkable one of the American Cretaceous genus *Hesperornis*. It is therefore probable that both *Enaliornis* and *Baptornis* were furnished with teeth, and were more or less intimately related to *Hesperornis*. It is scarcely necessary to mention that very different views have been entertained as to the affinities of the latter. Thus Professor O. C. Marsh, its original describer, while comparing its bones *seriatim* with those of *Colymbus*, spoke of it as a "swimming Ostrich," a confusion of ideas which it is somewhat difficult to understand. Subsequently Professor Alfred Newton decisively referred the genus to the Ratitæ, a view which has been recently disputed by Professor D'Arcy Thompson in a recent issue of the 'Studies from the Museum of University College, Dundee.' Herein it is concluded that *Hesperornis* was a flightless bird so closely allied to *Colymbus* that it must find a position in the same subclass or order. In spite of the weight attaching to any opinion expressed by the Cambridge Professor, the present writer, from his own studies, can but range himself on the side of Professor D'Arcy Thompson, and conclude that *Hesperornis*, and probably *Enaliornis* and *Baptornis*, must be placed in a distinct group of the Carinatae, for which Professor Marsh's name *Odontolæ* may be retained.

Thus concludes this brief summary of the present state of our knowledge of British Fossil Birds. It is hoped that this attempt to bring together in a concise form the present state of the subject will result in so stimulating collectors that the list of species and genera will ere long be largely augmented.